The life cycle of a low mass star

#physics

The life cycle of a low mass star, such as one similar to our Sun, typically follows these stages:

1. **Nebula**: A star begins its life as a giant cloud of hydrogen gas and dust called a nebula.
2. **Protostar**: Gravity pulls the particles in the nebula closer together, forming a hot ball of gas known as a protostar. As the particles collide more frequently, the temperature increases.
3. **Main Sequence Star**: When the protostar becomes hot enough, nuclear fusion reactions start within its core, fusing hydrogen nuclei to form helium. This releases energy, keeping the core hot and the star stable. The inward force of gravity is balanced by the outward pressure from the hot gases, marking the birth of a main-sequence star.
4. **Red Giant**: After billions of years, the hydrogen fuel runs low, and fusion reactions in the core slow down. The core shrinks and heats up, causing the outer layers to expand and cool, turning the star into a red giant.
5. **White Dwarf**: Eventually, the star sheds its outer layers, and the remaining core collapses under gravity, forming a white dwarf. This white dwarf will cool down over time, emitting less energy.
6. **Black Dwarf**: In the very final stages, a white dwarf will continue to cool and fade until it becomes a black dwarf, which no longer emits significant heat or light.

For the IGCSE Edexcel syllabus, it's important to remember these stages and be able to describe them in a logically structured manner, especially for potential exam questions. Remember, the end stages (red giant, white dwarf, black dwarf) differ for stars much larger than the Sun.

The life cycle of a high mass star

#physics

The life cycle of a high mass star, which is much larger than our Sun, includes the following stages:

1. **Nebula**: The process begins with a nebula, a vast cloud of hydrogen gas and dust.

2. **Protostar**: Gravity causes the nebula to collapse into a protostar, where density and temperature increase due to the compression of material.

3. **Main Sequence Star**: Once the temperature is high enough, nuclear fusion ignites, converting hydrogen into helium, and the star enters the main sequence phase. This is a stable period where the outward pressure from nuclear fusion balances the inward pull of gravity.

4. **Red Supergiant**: As hydrogen in the core is depleted, the star expands and cools into a red supergiant. Fusion continues in shells around the core, with heavier elements being produced (carbon and iron).

5. **Supernova**: When fusion can no longer sustain the core, it collapses and then rebounds, causing a massive explosion known as a supernova. This explosion disperses the star's outer layers into space.

6. **Neutron Star or Black Hole**: The core that remains after the supernova can form a neutron star, an incredibly dense object composed mostly of neutrons. If the core is massive enough, it will collapse further into a black hole, a point in space with gravity so strong that not even light can escape.

High Mass Star:

- R136a1
- Ha Carinea
- Pistol Star
- WR 101e